The Pile of Least Effort: Supporting Lived Document Management Practices

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ABSTRACT
This paper outlines early results from ethnographic research examining the ways people organise and manage their personal documents in an office, with a focus on people who engage in piling. The study encompassed in-depth interview data, questionnaire data and explorations of technology prototypes with participants. We build upon existing personal information management (PIM) research and develop a framework to encompass the real world of paper document management. In this paper, we highlight the challenges of being a piler, and suggest how they might be remedied or alleviated through design considerations for future support systems.

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H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Despite wild promises of the paperless office in years gone by, the typical office has remained a pretty staid affair. Interestingly, academics working in related areas have tended to bypass the (fascinating) realm of paperwork and head directly for the seemingly more exciting domains of electronic and paperless information management (e.g. Mander et al. and their work on digital piles.) The work reported in this paper is therefore distinct from other research in that it focuses on examining and supporting existing, paper bound practices through the application of computing technologies. Thus the concept of 'calm computing' (Weiser, 1991) and the general idea of making our lives easier and less stressful through the use of technology can be applied to personal document management.

It is quite telling that despite enormous technical progress in allowing electronic access to information, the majority of people continue to rely on paper. Whilst the once futuristic ideal of 'information at your fingertips' has materialised in numerous ways, the ability of information technologies to deliver information (more precisely: data) instantly has not diminished the love for paper. The reasons for this, such as its affordances of simple authoring, reading, reviewing, annotating, collaborating and sharing are all well documented (Whittaker & Hirschberg, 2001; Sellen & Harper, 2002).

Despite the advantages of using paper there are also significant disadvantages. The work reported in this paper seeks to understand the disadvantages and allow technology to make things better. The aim of this work is to explore, highlight and possibly ease some of the disadvantages to paper use, for the most common type of paper user: the *piler*.

We proceed as follows: first, we discuss a case study of information workers, where piling was found to be the dominant form of document management. Then, we discuss design considerations emerging from an ongoing study of document piling practices by information workers. The paper concludes with a set of recommendations for future work in examining both personal document management and technological support for existing information practice.

PILING REMAINS UBIQUITOUS
Why did we choose to focus on the piler? In an ongoing case study of information workers, piling was found to be the dominant form of document management. The first stage of this study was a 49 participant questionnaire, completed via the world wide web. Participants were drawn from a variety of professions, most significantly from academic staff, healthcare practitioners and a variety of school-level teachers. Participant recruitment took place via email; all participants were known to the researcher, with the hopes that this would establish a trust basis – something that has been successful in past work (Boardman, 2004). Any potential bias was outweighed by the more thorough and relaxed approach to examining all aspects of the office that this decision afforded.

Compared to other studies in the PIM area, such as the 50 participant study of Whittaker & Hirschberg (2001), and the 10 participant study of Malone (1983), the number of participants was strong. Core findings from the questionnaire include:

Most people are pilers: the data gathered in the survey overwhelmingly indicates that the majority of those participating engaged in piling. This does not break new ground, but solidifies suggestions made in past research (Boardman, 2004), setting a strong foundation for this work. A typical response to the survey was the following answer from one participant: *"Yes, I create piles. The paperwork in the office is usually spread out in front of the computer, often without any predesigned order."*

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Pilers prefer piling: in a study of how people use their offices, Malone (1983) described pilers as people who place their documents in the places of most convenience. This naturally leads them to pile up over time, in a relatively unstructured way. Intriguingly, the majority of participants went out of their way to point out how much they preferred piling to any other alternatives. One participant, strongly representative of the group, put forth the rather dramatic: *"I would never stop piling, filing stuff all the time simply requires too much time and effort. You can take my piles away over my dead body!"*

Piling reminds: the idea that piling reminds was a striking fact that emerged from the majority of participants. Creating piles allows a reminder of the documents in those piles. This is best illustrated with another quote from a participant: *"My pile goes in a location I choose, not some arbitrary filing cabinet, and I can designate piles to very loose categories. Bills that need to be paid get paid on time because I see them on the pile immediately in front of me and remember to sort them out!"* This is in line with past research by Elsweiler (2007), who found that, when filed, information is often not found within its period of usefulness; piling seems to present a strong way of accessing information while it is still useful.

Piling serves frequent use: things that get piled are far more accessible than things that are filed away, simply by virtue of the fact they are in an individual's immediate vicinity. Because of this, piling is suitable for information that needs to be dealt with in a more immediate time period, or for something that is looked at frequently.

Piling simplifies classification: when creating piles, people do not have to determine a category for something; they merely place it on the pile of most convenience. This seems to reduce both the cognitive burden of filing classification as well as the time needed to retrieve something when it is required. Many of these findings have been pointed to by HCI and CSCW literature (for example, Dix et al., 1998) - but, as mentioned earlier, the general thrust of research appears to be *away* from investigating paper based document practices, towards presumably more convenient and flexible electronic document management. The findings motivated us to look into more detail of piling through the lens of a conceptual 'piling practices' framework.

A FRAMEWORK FOR INVESTIGATING PILING AS A PERSONAL DOCUMENT MANAGEMENT PRACTICE

Barreau (1995) offers a compelling multi-stage framework for the examination of personal information management (PIM): the stages of information retrieval, maintenance, organisation and acquisition.

Information retrieval refers to the procedures an individual goes through when they seek a specific piece of physical information; typically, and perhaps obviously, they look to their own collections before seeking elsewhere (Wilson, 2000; Bruce, 2005). Information maintenance refers to the updating, archiving and destruction of items being managed by an individual (Barreau, 1995). Closely related to maintenance, information organisation involves the tools and procedures used to classify, name, group and place information in order to provide for later retrieval. Finally, information acquisition refers to the ways people acquire, and decide to acquire, different information.

PILING: THE GOOD, THE BAD, AND THE UGLY

Pilers who had agreed to be part of follow-up research participated in semi-structured interviews. As a method, such interviews provide an exceptionally strong basis for pursuing topics whilst allowing the needed flexibility for relevant diversions (Drever, 1995). Since a key aspect of this research was the examination of a real-world practice, the natural setting and flow of semi-structured interviews in participants' offices was most suitable.

Inspired by Malone (1983), questions included a request for a tour of the office and queries regarding the reasons for the location of particular pieces of information. Prompting questions such as *"Why is this pile here?"* and *"How did this document get here?"* were occasionally interjected by the researcher in order to focus the discussion. The comments and answers made by the 10 participants were noted and complemented with notes, annotations and observations made by the researcher. Photographs and sketches of participants' offices were collected and created to document the position, size and amount of piles, as well as the general design and layout of the office.

Of course, when examining something so personal, the highly individualistic nature must be considered at all points. Barreau's framework, while stemming from research into digital document management, provides an excellent scaffold on which to examine the real world of paper discussed here. By developing this framework to describe physical personal document management from the perspective of those who create piles, and using the data collected to generate profiles, case studies and examples, a clear picture of both the needs and challenges of pilers can be developed.

Dissecting the problems of piling

Here we examine each of the stages of document management in the framework, incorporating observations from the surveys mentioned earlier as well as snippets of the data gathered so far in the ongoing semi-structured interviews. By doing this, a bigger picture of the problems inherent to piling can be created; this, in turn, allows discussion on design considerations to begin. The framework described earlier is now used to examine piling:

Information retrieval: the biggest single problem related to information retrieval identified by the study so far is the issue of out of date information. As noted earlier, the relevance of information when it is located is an ongoing concern of information management. While piling simplifies things, the issue of documents getting buried in the midst of a pile presents a problem. Similarly, the criteria that people use to re-find information is important to consider. The data so far suggests that context is the most important factor for pilers. One participant

commented: *"The paper is usually unlisted [location is not noted anywhere] and I rely on my memory. I usually remember things like 'it is in the pile to the left of the printer' or 'I last saw it next to the dictionary'."* This sentiment is echoed in nearly all of the interviews so far; many participants commented along the lines of the first interview subject, who said: *"Location [context] is the biggest hint in my mind when I'm looking for something. I waste most of my time trying to find things by leafing through a pile where I suspect it will be. I'm usually right, searching the pile just takes time."*

Therefore, while we suggest that piles are extremely valuable to people for a number of reasons, context and ease of access primary among them. The size (or depth) of piles represents a potentially large problem that might be considered for easing.

***Information maintenance*:** every single participant to date acknowledged the extreme importance of information maintenance to an effective personal document management system, but all likewise acknowledged that they spent very little time on it. This work contends that people pile because piles let them both maintain information as well as be reminded of things that need to be done with the information. Past research in the psychology discipline supports this (Elsweiler, 2007). Piles can be thought of as a form of short-term memory; as they are located spatially around an office, they provide support for two key elements of information maintenance: context and reminding for actions that need to be performed (Jones et al., 2002; Elsweiler, 2007). The results here support this; neatly summarizing this contention, one participant remarked: *"I can stack my stuff up and I remember to take care of it, it's maintained in the heap and I can put the heaps in places around my desk that will remind me what needs doing."* It can be seen that piling is not necessarily the wrong choice; the good choice at the point of piling here lies more with the selection of pile rather than the act of piling itself. When considering how to support piles, assisting good choices at the point of piling as well as assisting pile traversal both seem to be crucial starting points.

Information organisation: In the context of piling, information maintenance typically involves determining which pile to place something on. One survey participant commented: *"I file long term stuff and it takes ages to figure out good classification schemes and groups. My short term stuff is all piled around my desk, the organisation procedure at that point involves working out which pile it would serve me best on ... that typically means either the one [pile] closest to something related to the new document or the most convenient pile ... or a combination of that."* This effectively summarises information organisation from the perspective of this research. It is demonstrated that piling gives people a convenient and immediate way of organising, but presents problems in other areas. Extending the past research, this suggests that the ability of people to retrieve items declines when the number of unlabeled or piled objects increases (Malone, 1983; Jones & Dumais, 1986).

Information acquisition: whilst piling is not strictly related with the ways in which documents are acquired, the inadvertent acquisition of information which is not required can create collections of useless information that make it more difficult for people to find things that they actually need. As noted by one participant: *"It is isn't really a problem that useless stuff ends up on my piles, it's just that they make the piles larger and waste my time when I'm looking for things I do need. It wouldn't matter if I just knew what was in each pile."*

DISCUSSION

Personal information management (PIM), and personal document management in general, are important and distinctly personal activities; they refer to the methods people employ in order to collect, store, organise and retrieve information under their control. While much research focuses on the means by which paper can be excised from our daily lives, it still remains important, in a huge way, in the real world.

Not totally unexpected, our studies revealed supporting piling to be a significant, multi-disciplinary research challenge. What we did not expect however, was that people really do enjoy piling (over filing), and they do so for a number of reasons. Primary among these reasons, piles allow them to be reminded of things. Having physical copies of things that need to be dealt with, piled in the immediate vicinity of their work area, enables them to remember to attend to them. Similarly, piling allows them to spend more time working (or playing) rather than managing a filing system and classifying paperwork.

This research suggests a number of design considerations for tools for supporting pilers, as well as tools for supporting existing activities in a general sense. Very much in line with past research into user resistance to change, we suggest it is crucial to integrate with preexisting document management practices. User resistance to changes in workflow, however small, is a well-documented phenomenon (Te'eni et al., 2007).

The data in the present study particularly suggests that when it comes to pilers, people do not appreciate being asked to place their documents in a specific place – lest it turn them into filers. Many past studies have proposed systems that position themselves as requiring very little input from the user, with the system taking lots under control – systems such as the one proposed by Maus et al. (2005) (amongst many others) suggest the elimination of paper piles through the introduction of an "intelligent office appliance". This goes against the idea of supporting existing workflows, and negates the aforementioned benefits of paper. This is not the path we propose; instead, we suggest that piling is successful because it forces very little upon the user, and requires very little complicity in return, therefore requiring very little in behaviour changes. Lansdale (1988) commented that the more a system does, the fewer the users who will want its help. Piling is an excellent example of the inverse of this. In order to explore these ideas further, a prototype support system was developed and explored with interview participants.

Preliminary prototype exploration

In the most recent set of interviews, 6 participants were exposed to relatively low-fidelity prototypes of a support system for piles based around radio-frequency identification (RFID) technology. The goal was to trigger discussion rather than present a solution.

These prototypes consisted of an Apple iPhone connected to a very small RFID scanner. Several adhesive labels containing RFID tags were affixed to a variety of coloured documents; these documents were deposited in the midst of preexisting piles in participants' offices and it was demonstrated how easily and swiftly the RFID equipped iPhone was able to locate and identify the tagged documents (by name – examining identification criteria for such a system is necessary to develop this research further), without necessitating rifling through the piles.

The researcher wrote down participants' reactions, questions and activities with these prototypes. Photographs and sketches were made; and, as part of the semi-structured interviews, participants engaged in what often became a lively discussion with the researcher about the potential for technology to assist with piling. Taking into consideration the (sometimes exciting) nature of prototypes, findings suggest that for future work, people are very willing to engage with technology that integrates with their existing way of managing their information.

CONCLUSION

In this paper, piling has been discussed as a viable means of personal document management as well as a useful conceptual lens with which to examine the nature of personal document management and drive discussion and design of new document management tools that can serve individuals firmly rooted in their existing habits. Our study determined that the majority of people were pilers, and enjoyed being pilers. This was a fascinating discovery that perhaps deviated from the way people might expect things to be. This, in turn, motivated us to examine piling in more detail through a still ongoing series of semi-structured interviews and prototype experiments. By examining piling, and through it genuine lived document management practices, some pointers to a deeper understanding of how people actually work, and how they can be supported have been gained. Our future research in this area will address in more detail user behaviour, reactions to technology, the use of interfaces to physical data and privacy concerns.

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